

Fueling the Future

OVERVIEW

Students compare energy use and CO₂ emissions by sector in the United States and China (and optionally in another country). They research and discuss energy impacts and sustainable energy solutions, write a resolution addressing energy use, and present their resolutions at a “World Energy Summit”.

INQUIRY/CRITICAL THINKING QUESTIONS

- How does energy use by different sectors compare between the U.S. and China?
- How is energy use connected to other global issues?
- What can be done to conserve energy resources and reduce CO₂ emissions?

OBJECTIVES

Students will:

- Calculate and compare the percentage of energy use and emissions by country and sector to world average energy use and emissions
- Brainstorm and research impacts of energy use by sector
- Brainstorm and research sustainable energy solutions
- Write a resolution
- Present their resolution at a mock “World Energy Summit”

TIME REQUIRED: 2 hours

KEY ISSUES/CONCEPTS

- **Energy use**
- **Renewable and non-renewable energy resources**
- **Climate change**
- **Energy conservation**

SUBJECT AREAS

- **Social Studies**
(World History, Geography, Civics/ Government, Global Studies, Contemporary World Problems)
- **Science**
(Earth, Environmental, Physical)
- **Math**
- **Language Arts**

NATIONAL STANDARDS CONSISTENCY

- **NCSS: 3, 6, 7, 8, 9, 10**
- **NSES: D, E, F**

GRADE LEVEL: 7–12



FTF Related Reading

- Intermediate: Chapter 6 from *Global Issues and Sustainable Solutions*
- Advanced: Unit 3, Chapter 4 from *It's All Connected*

Materials/Preparation

- A few items to show during the introduction segment of the activity (e.g. food, clothing,

a book, computer, etc.)

- Handout: *Energy Use by Country and Sectors Table*, 1 per 2-4 students
- Handout: *Fueling the Future Role Cards*, copy and cut
- Handout/Overhead: *Writing a Resolution Worksheet*, 1 per student
- Calculators, 1 per group of 2-4 students

Fueling the Future

Activity – Day 1

Introduction

1. Show students some items (e.g. food, clothing, a book, computer, etc.) 1 at a time and ask them how energy is connected to the manufacturing and use of the item.
2. Tell the class they are going to do an activity that examines and compares the type and amount of energy use and emissions in the U.S. and China.

Steps

1. Write on the board or overhead these 3 energy sectors: Transportation, Residential, and Industrial/ Commercial.
2. Have students brainstorm different uses of energy (e.g. cars, home heating and cooling, lights, food production, etc.) and list them below the appropriate sector.
3. Divide the class into 6 groups of 2-4 students representing the 3 energy use sectors (transportation, residential, and industrial/commercial) for both the U.S. and China (Note: For classes with more than 24 students, divide into 9 groups representing the U.S., China, and another country's energy sectors. For country profiles of energy use by sector visit the World Resource Institute's website at www.earthtrends.wri.org).
4. Give each group a copy of *Energy Use by Country and Sectors Table* and 1 Role Card (there will be 2 groups of each energy sector – 1 for the U.S. and 1 for China).
5. Give groups about 15 minutes to complete the table for their country and sector, following the prompts on the Role Cards (calculate percent, list uses and impacts, and brainstorm sustainable energy solutions). Each group will need a calculator to figure out their percentages. Sustainable energy solution ideas can be found in Unit 3, Chapter 5 of *It's All Connected*.
6. Have a representative from each group report to the class on the percentages in the first section of the table and have students fill in their tables based on the reported data from the other groups.
7. Bring the class back together for the following discussion prompts and questions (after the discussion, have the students either hold onto their completed *Energy Use by Country and Sectors Table* or collect the worksheets and pass them out again on Day 2 of the activity).

Assessment – Day 1 Reflection Questions

For Intermediate and Advanced Students

- Discuss the difference in percentages between U.S. and China energy use and emissions.
- Which sectors use the most energy? Which country uses the most energy?
- Why should we care about energy use and emissions? What effects does it have on people and the planet?
- Have students share and discuss their brainstorm lists of energy uses by different sectors.
- Have students share and discuss their sustainable energy solutions.

Activity – Day 2

Introduction

1. Tell the class that they are going to participate in a "World Energy Summit" in which they will work together in U.S./China sector groups to develop a policy addressing energy consumption, conservation, and

Fueling the Future



emission reductions. Tell them that they will be writing a resolution about their energy policy.

Steps

1. Put up the overhead, *Writing a Resolution Worksheet*, and go over what a resolution is with the class.
2. Arrange the class so that each sector joins together with the same sector from the other country. There will be 3 larger groups comprised of a U.S./China transportation sector, a U.S./China residential sector, and a U.S./China industrial/commercial sector.
3. Give the groups about 10-15 minutes to discuss and decide on 1 or 2 policies to address energy consumption, conservation, and emission reductions. They will need to refer to the "Sustainable Energy Solutions" section of the *Energy Use by Country and Sectors Table* that they completed on Day 1 of the activity.
4. Give the groups about 15-20 minutes to write a resolution and to prepare to present

Give 1 *Writing a Resolution Worksheet* to each group. Have the groups assign roles: facilitator, timekeeper, note taker, and reporter.

Fueling the Future

- their resolution to the class.
5. Hold a “World Energy Summit” in which each group has 3-5 minutes to present their resolution to the class.
 6. Each student should take notes on the resolutions that are presented so they can discuss and vote on the resolutions later.
 7. After all groups present, facilitate a discussion on the pros and cons of each resolution.
 8. Have students vote on each resolution.
 9. Conclude with the following reflection questions.

Assessment Reflection Questions

For Intermediate and Advanced Students

- Did the resolution process work? Were we able to develop some good energy policies?
- What are the limitations of this process?
- What are some other ways that governments, groups, and individuals can effect change in energy use and emissions?
- What other global issues are connected to energy?

For Advanced Students

- What are some of the hidden costs of using non-renewable energy?
- How can developing countries meet



their growing energy needs in a sustainable manner? Discuss the concept of “leapfrog technology” in which modern, sustainable technologies are transferred to developing countries, avoiding the unsustainable stage of industrial development that developed countries experienced.

Technology Extension

- Have students visit the Climate

Analysis Indicators Tool (CAIT) developed by the World Resources Institute at <http://cait.wri.org>, where they can research and create a multitude of charts and graphs on global climate change and energy use by sector and country.

Action Projects

- Have students write an essay explaining what they would do if they were unable to use any oil- or gasoline-powered vehicles once a week. Then have them plan and implement “fossil-fuel free” activity days for their family and neighborhood.
- Create a more energy-efficient learning environment. Many local energy companies or city utility agencies are teaming together with students to save schools and districts energy and money and to beautify learning environments.

Fueling the Future

By providing energy audits, technical assistance with retrofit plans, information about financing methods, staff training, and educational programs, these companies and agencies can help schools identify many ways to save energy and money. Have students investigate local energy and utility companies to identify the resources and opportunities that are available to address energy consumption in their school or district. Your students can play a critical role in educating their peers and community on the many benefits of creating a more energy-efficient learning environment.

- Visit www.facingthefuture.org and click on **Take Action**, and then **Fast Facts Quick Actions** for more information and action opportunities related to energy use.

Additional Resources

Films

- *Rising Waters: Global Warming and the Fate of the Pacific Islands*, directed by Andrea Torrice, 2000, 57 minutes. Through personal stories of Pacific Islanders in Kiribati, the Samoas, the atolls of Micronesia, and Hawaii, as well as researchers in the continental United States, this documentary film puts a human face on the international climate change debate.
- *Silent Sentinels*, directed by Richard Smith, produced by the Australian Broadcasting Corporation, 1999, 57 minutes. This documentary film takes a broad look at coral reefs and how the coral organism has coped with climate change over time.

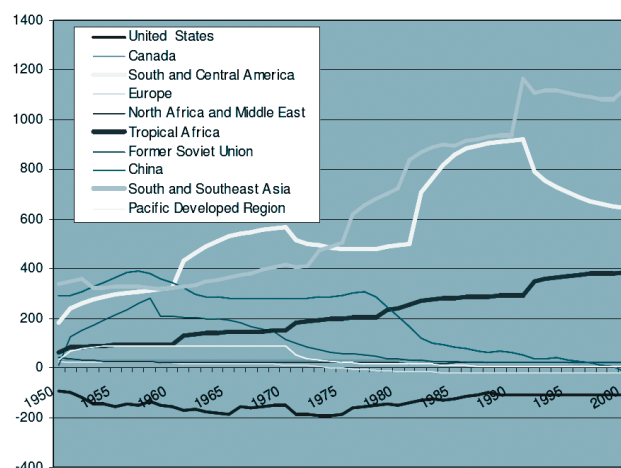
Books

- *Stormy Weather: 101 Solutions to Global Climate Change*, Guy Dauncey with Patrick Mazza, New Society Publishers, 2001. This book provides a comprehensive view of energy issues and practical solutions.

Websites

- www.earthtrends.wri.org – World Resources Institute's "Earth Trends" is a comprehensive on-line database that focuses on environmental, economic, and social trends. "Country Profiles" present environmental information about key variables for several topic areas. View charts and graphs to find statistics for over 220 countries.
- <http://cait.wri.org> – The Climate Analysis Indicators Tool (CAIT) is an information and analysis tool on global climate change developed by the World Resources Institute.

Sample from CAIT Resources & Links:
Annual sources (+) and sinks (-) of carbon from 10 world regions.



Fueling the Future

Energy Use by Countries and Sectors Table

Energy Consumption/Year * <i>(million metric tons of oil equivalent) †</i>	United States (1999)	U.S. %‡ of World Energy Use	China (1999)	China %‡ of World Energy Use	Total World Energy Use (1999)	Other Country <i>(use, emissions, and % of world energy use)</i>
Transportation	601,275		69,176		1,755,505	
Residential	254,209		289,489		1,845,475	
Industrial/Commercial§	554,076		363,523		2,818,316	
CO2 Emissions/Year <i>(million metric tons)</i>						
Transportation	1,693		221		5,505	
Residential	352		211		1,802	
Industrial/Commercial**	3,225		2,399		14,235	
Energy Uses and Impacts <i>Brainstorm different ways that energy is used in each sector and their impacts</i>						
Transportation Uses			Transportation Impacts			
Residential Uses			Residential Impacts			
Industrial/Commercial Uses			Industrial/Commercial Impacts Uses			
Sustainable Energy Solutions <i>Brainstorm alternatives to reduce and conserve energy use for each sector</i>						
Transportation						
Residential						
Industrial/Commercial						

* SOURCE: World Resource Institute EarthTrends www.earthtrends.wri.org

† A 'million metric ton of oil equivalent' is a measurement of energy. It is equal to the amount of energy in 1 metric ton of crude oil, 107 kilocalories or 41.868 gigajoules.

‡ To find % of World Energy Use divide U.S. total and China total by Total World Energy Use.

§ This category includes industry, agriculture, commercial, and public services.

** This category includes public electricity, heat production, auto producers, other energy industries, manufacturing industries, and construction.

Fueling the Future Role Cards (country and energy sectors)

<p>Country: China</p> <p>Energy Sector: Transportation</p> <ol style="list-style-type: none"> 1. Calculate your sector's percentage of the world's energy use and emissions 2. List uses and impacts of your sector 3. Brainstorm sustainable energy solutions for your sector 	<p>Country: United States</p> <p>Energy Sector: Transportation</p> <ol style="list-style-type: none"> 1. Calculate your sector's percentage of the world's energy use and emissions 2. List uses and impacts of your sector 3. Brainstorm sustainable energy solutions for your sector 	<p>Country:</p> <p>Energy Sector: Transportation</p> <ol style="list-style-type: none"> 1. Calculate your sector's percentage of the world's energy use and emissions 2. List uses and impacts of your sector 3. Brainstorm sustainable energy solutions for your sector
<p>Country: China</p> <p>Energy Sector: Residential</p> <ol style="list-style-type: none"> 1. Calculate your sector's percentage of the world's energy use and emissions 2. List uses and impacts of your sector 3. Brainstorm sustainable energy solutions for your sector 	<p>Country: United States</p> <p>Energy Sector: Residential</p> <ol style="list-style-type: none"> 1. Calculate your sector's percentage of the world's energy use and emissions 2. List uses and impacts of your sector 3. Brainstorm sustainable energy solutions for your sector 	<p>Country:</p> <p>Energy Sector: Residential</p> <ol style="list-style-type: none"> 1. Calculate your sector's percentage of the world's energy use and emissions 2. List uses and impacts of your sector 3. Brainstorm sustainable energy solutions for your sector
<p>Country: China</p> <p>Energy Sector: Industrial/Commercial</p> <ol style="list-style-type: none"> 1. Calculate your sector's percentage of the world's energy use and emissions 2. List uses and impacts of your sector 3. Brainstorm sustainable energy solutions for your sector 	<p>Country: United States</p> <p>Energy Sector: Industrial/Commercial</p> <ol style="list-style-type: none"> 1. Calculate your sector's percentage of the world's energy use and emissions 2. List uses and impacts of your sector 3. Brainstorm sustainable energy solutions for your sector 	<p>Country:</p> <p>Energy Sector: Industrial/Commercial</p> <ol style="list-style-type: none"> 1. Calculate your sector's percentage of the world's energy use and emissions 2. List uses and impacts of your sector 3. Brainstorm sustainable energy solutions for your sector

Lesson 17 Handout:

Fueling the Future–Writing a Resolution

What is a Resolution?

A resolution is a formal way of stating intended action by a group. Resolutions are used by decision-making bodies ranging from local school boards to the United Nations. A resolution usually consists of 2 main parts:

1. **PREAMBLE:** The *Whereas* clause(s) contains background information and reasons for the resolution.
2. **REQUEST FOR ACTION:** The *Resolved* clause(s) contains the request for action.

Steps in Preparing a Resolution

1. Identify the issue of concern.
2. Research and gather supporting background materials which are sufficient to allow a person with no prior knowledge of the subject to make an informed, intelligent decision.
3. Write a draft and then a final resolution in the proposed format, taking care to ensure that:
 - Each **“Whereas”** clause is accompanied by sufficient background material.
 - At least 1 of the **“be it Resolved”** clauses directs government (or other entity) to take action.
4. Select a representative(s) from your group to present and provide rationale in support of your resolution at the World Energy Summit.

How to Write a Resolution

Write the sections of your resolution in the following format:

1. The *Heading* serves as identification for the resolution and states WHERE the resolution will be submitted, WHAT the subject of the resolution is, and WHO is proposing the action.
2. The *Preamble* is used to explain WHY the action in the *Resolved* section should be taken. It states past action, reasons for the action, and reasons for concern. Each *Preamble* clause should be written as a separate paragraph, beginning with *Whereas* and ending with a semi-colon. The last paragraph of the *Preamble* should end with a connecting phrase such as “Therefore be it...”
3. The *Resolved* section indicates what action is proposed. The word RESOLVED is underlined and printed in capital letters, followed by a comma and the word “that”. Each resolved clause is a separate paragraph and ends with a semi-colon, and in the case of the next to the last clause should be followed by “and”.

Sample Resolution:

SUBMITTED TO: Our Class

SUBJECT: Writing a Resolution

PROPOSED BY: Our Teacher

Whereas we are studying energy use and emissions;

Whereas we have become experts on energy use and emissions for specific countries and energy use sectors;

Whereas we are holding a World Energy Summit;

Whereas we are learning to write a resolution for the World Energy Summit;

therefore, be it RESOLVED, that:

We agree to follow these guidelines in writing a resolution for the World Energy Summit;

We promise to work together to write a great resolution;

We will develop policies to conserve energy use and reduce emissions; and

We will present our findings at the World Energy Summit.

For more information on writing a resolution, visit the United Nations Online website at

<http://www.unol.org/res/rw3.shtml>